1998 to 2001 • Advanced Light Source Science Highlights

ATOMIC AND MOLECULAR SCIENCE

Anionic Photofragmentation of Co – *A Selective Probe of Molecular Core-Level Resonances*

Quantum Chaos in Helium – *Transition to Chaos Observed in a Simple Quantum System*

Photoelectron Diffraction Mapping – *Gas-Phase Molecules Illuminated from Within*

More Trouble for the Dipole Approximation – *Second-Order Corrections Found in Soft X-Ray Photoemission*

Symmetry-Resolved Photoelectron Spectroscopy – *Experimental Evidence for a Shape Resonance in Acetylene*

Electron-Electron Interactions in Neon – *Angle-Resolved, Two-Dimensional Imaging Reveals Significant Effects*

CHEMICAL DYNAMICS

Recalibration of Proton Affinities – *PFI-PEPICO Yields Key Measurements with Unprecedented Accuracy*

Metathesis Reactions in Pentane and Propane – *Hydrogen-Abstraction Dynamics Probed with Synchrotron Radiation*

COMPLEX MATERIALS

Electron-Phonon Coupling in HTSCs – *Strong Lattice Vibration Role in Superconductivity Suggested*

Electronic Structure of CMR Oxides – *Fermi Surface Drives Fluctuating Nanoscale Phase Separation*

Electronic Structure of Quasicrystals – *Band Structure is Similar to That of Normal Metals*

Charge Stripes in High-T_c Superconductors – *One-Dimensional Structures Raise New Questions*

Hydrogen-Induced Metal-Insulator Transition in Yttrium – *Probing the Local Electronic Structure with Soft X-Ray Emission and Absorption*

Resonant X-Ray Raman Scattering of $Sr_2CuO_2Cl_2$ – Establishing *Energy Scales in High-Temperature Superconductors*

Site-Specific X-Ray Emission Spectroscopy – *Examining Bonding Electrons at Different Oxygen Sites in Sr_2RuO_4*

ENVIRONMENTAL AND EARTH SCIENCE

EXAFS from Hydrogen Atoms in Water – *A New Tool for Detecting the Faint Echo of Hydrogen*

Synchrotron IR Spectromicroscopy of Living Cells – *Spectra Show Changes Induced by Dioxin*

Unearthing the Structure of Humic Substances – *In-Situ X-Ray Microscopy Reveals Impact of Environmental Context on Structure*

Quantitative Zinc Speciation in Soils – *Attacking Complexity with Complementary X-Ray Techniques*

Microbial Reduction of Hexavalent Chromium – *Monitored Nondestructively for the First Time by Infrared Spectromicroscopy*

MAGNETISM AND MAGNETIC MATERIALS

Modified Magnetism at Buried Interfaces – *Circularly Polarized X-Ray Standing Waves Probe Nanostructures*

Antiferromagnetic Spin Reorientation – *NiO Interface Spins Shift in Response to Adjacent Co Layer*

Imaging Exchange Bias in Magnetic Layers – *Photoemission Electron Microscope Directly Views Spin Alignment*

Microscopy of Antiferromagnetic Surfaces – *First Surface Image with Clear Antiferromagentic Contrast*

Quantum-Well States in Copper Thin Films – *Directly Probing the Spatial Variation of the Wavefunction*

X-Ray Resonant Scattering from Magnetic Multilayers – *A Photon-In/Photon-Out Way to Obtain Optical Constants*

Quantum Well States in Magnetic Multilayers – *Interference Effects Observed through Photoemission Experiments*

NANOSTRUCTURES AND SEMICONDUCTORS

X-Ray Diffraction from Coherent Phonons – *Streak Camera Records Ultrafast Lattice Dynamics*

Femtosecond Structural Dynamics – *Time-Resolved X-Ray Diffraction of Laser-Excited InSb*

POLYMERS, BIOMATERIALS, AND SOFT MATTER

Crosslink Density of Superabsorbent Polymers – *X-Ray Spectromicroscopy Provides Feedback for Process Improvements*

Vibronic Features in Polymer NEXAFS – *"Small-Molecule" Effect Seen in Polystyrene Spectrum*

Dynamic Scattering of Coherent Soft X Rays – *Laser-Like X Rays Illuminate Fast Fluctuations in Molecules*

Polymers in Confined Geometries – *Characterization of Thin Bilayer Films by NEXAFS Microscopy*

PROTEIN CRYSTALLOGRAPHY

Switch-Based Mechanism of Kinesin – *Motor-Enzyme Action Captured in "Snapshots" of Two Key States*

Zooming in on Ribosomes – *Resolution Improves to 5.5 Å*

First High-Resolution Structure for an Aquaporin – *Glycerol Conducting Channel Reveals Selectivity Mechanism*

Structure of HIV-1 Rev Binding Element (RBE) – *Novel Base Pairing and Unexpected Flexibility in Key HIV Genetic Domain*

Architecture of RNA Polymerase II – *Structural Clues Help Unravel Intricacies of DNA Transcription*

Structure of a Key Link in the Respiratory Chain – *The* Escherichia coli *Fumarate Reductase Respiratory Complex*

Bacteriorhodopsin: Pumping Ions – *Ion Transport Is Net Result of Small Changes in Protein Structure*

Solving the Ribosome Puzzle – *ALS Protein Crystallography Reveals How Pieces Fit Together*

Clathrin Structure Reveals Assembly Motifs – *Leg Region of Triskelion a Series of Ten-Helix Repeats*

First Structure of a Key Molecular Engine – *HisP Protein Structure Carries Important Medical Implications*

Structural Genomics of *M. jannaschii* – *Rapid Structural Determination of Proteins Using MAD Phasing*

SURFACE AND INTERFACE SCIENCE

How Carbon Monoxide Adsorbs at Different Sites – *Interplay Between Electronic and Geometric Structures at Surfaces*

Electron-Phonon Coupling at the Tungsten Surface – *Hydrogen Adsorbate Vibrations Split Surface Electron Band*

Beyond the Chemical Shift – *Vibrational Fine Structure in XPS of CO Adsorbed on Ni*

TECHNIQUES: ACCELERATOR, BEAMLINE, AND EXPERIMENT

Frequency Map Analysis Applied to the ALS – *A Mathematical Technique to Improve Storage-Ring Performance*

Femtosecond Pulses of Synchrotron Radiation – *Laser Time-Slicing Will Lead to Ultrafast Time Resolution*

Extreme Ultraviolet (EUV) Interferometry – *Measuring Atomic-Scale Optical Imperfections for Future Microchip Generations*